

From: Steven Long
To: Lawrence Burkhart - NBR
Date: 11/7/01 3:48PM
Subject: Risk Word mods for LATEST DAVIS-BESSE ORDER

Larry,

The attached words are my attempt to modify section IV of the latest version of the order according to Mark's notes from the meeting with Chandler. Mark has read the attachment and OKed it for your use.

Steve

CC: F. Mark Reinhart; Jin Chung

D-51

IV

In addition to cracking phenomena observed at other facilities, the risk implications associated with vessel head penetration nozzle cracking and leakage warrant issuance of this order. Regulatory Issue Summary 2001-02, "Guidance on Risk-Informed Decisionmaking in License Amendment Reviews," dated January 18, 2001, provides a process for the staff to consider whether a "special circumstance" exists which may rebut the presumption that compliance with the regulations provides adequate protection of public health and safety. Although developed as a tool for staff reviews of license amendment requests, the process in Regulatory Issue Summary 2001-02 is appropriate for other regulatory decisionmaking purposes because it addresses the fundamental requirement for operation of a nuclear reactor: there is reasonable assurance of adequate protection for the public health and safety.

A special circumstance is present because compliance with 10 CFR 50.55a inservice inspection requirements for inspection of vessel heads (i.e., pursuant to Category B-P to Table IWB-2500-1 of Section XI, ASME Boiler and Pressure Vessel Code) is not adequate to detect degradation in the nozzles and protect against a loss-of-coolant accident and assure the structural integrity of the vessel head penetration nozzles. Failure of the regulations to require adequate monitoring for degradation in the vessel head penetration nozzles which could lead to a vessel head penetration nozzle failure, and consequently a loss-of-coolant accident, constitutes a risk factor not addressed by the regulations. Given that ASME Code requirements are not adequate to detect degradation in the nozzles, the licensee's reactor vessel head inspections, described in Section III, above, did not ameliorate the above deficiencies in the ASME Code inspection requirements. Thus, consistent with the Regulatory Issue Summary 2001-02 process, a special circumstance exists for the Davis-Besse Nuclear Power Station, Unit No. 1.

Applying the risk-informed decisionmaking process described in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," a special circumstance is acceptable if (1) it meets current regulations, (2) it is consistent with "defense-in-depth philosophy," (3) it maintains sufficient safety margin, (4) it results in only a small increase in core damage frequency, and (5) the basis for the risk estimate is monitored using performance measurement strategies. Although inspections that have been performed at Davis-Besse Nuclear Power Station, Unit No. 1, meet the first criterion because they have met the requirements of 10 CFR 50.55a, the second criterion is not satisfied because, compliance with the regulations may not be adequate to prevent the failure of the reactor coolant pressure boundary, one of the three barriers to release of radioactive materials from the reactor core. Compliance with the ASME Code, Section XI, inservice inspection requirements fails to satisfy the third principle of maintaining safety margins since it cannot be assured that pressure boundary leakage would be detected prior to a gross failure of a vessel head penetration nozzle.

The fourth principle is not met because the core damage frequency could eventually approach the relatively high numerical value of the conditional core damage probability for the loss-of-coolant accident that would result from a control rod drive mechanism nozzle failure. Based on the licensee's submittal dated November 1, 2001, the conditional core damage probability value is $2.7E-3$ for a control rod drive mechanism nozzle failure that produces a medium break loss-of-coolant accident. The high degree of uncertainty in the parameters needed to estimate the probability of occurrence and size of circumferential cracks in the nozzles precludes the staff from concluding that the probability of gross nozzle failure is now sufficiently small, in combination with conditional core damage probability of a failure, to satisfy the numerical guidance in criterion 4 of RG 1.174.

Finally, the fifth principle is not satisfied because the basis for any licensee analysis that

shows risk levels below Regulatory Guide 1.174 numerical guidelines must be based on assumptions that cannot be verified without performing inspections that are capable of detecting the form of degradation being modeled.

The final step for application of the Regulatory Issue Summary 2001-02 process involves identification of an adequate basis for establishing reasonable assurance of adequate protection when the "special circumstance" is considered. The Commission has established General Design Criteria (GDC) for the design, fabrication, construction, testing, and performance of structures, systems and components important to safety in Appendix A to 10 CFR Part 50, that identify features necessary for adequate protection. Three GDC are relevant to this issue. Criterion 14 states that "[t]he reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage or rapidly propagating failure, and of gross rupture." Criterion 30 states that "[m]eans shall be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage." Criterion 32 states, in part, that "components of the reactor coolant pressure boundary shall be designed to permit . . . periodic inspection and testing of important areas and features to assess their structural integrity and leak-tight integrity." Taken as a whole, these GDC emphasize that the Commission considers that it is extremely important from a safety standpoint to maintain the reactor coolant pressure boundary in a leaktight and structurally sound condition, with an extremely low probability of gross failure. These GDC are consistent with the requirements of Technical Specification, Section 3/4.4.6, that does not allow continued operation with any pressure boundary leakage, and the intent of the inservice inspection requirements of 10 CFR 50.55a(g)(4).

Failure of the licensee for Davis-Besse Nuclear Power Station, Unit No. 1, to conduct inspections of the reactor vessel head penetration nozzles in a manner that is sufficient to detect the extent of degradation caused by a mechanism known to be degrading other similar plants in that portion of the vessel and prior to a significant reduction in safety margin is inconsistent with these general design criteria. The level of degradation that has been found in other similar plants, if left undetected and uncorrected, could result in a gross failure of the reactor coolant pressure boundary (loss-of-coolant accident).

In summary, compliance with the ASME Code requirements specified in 10 CFR 50.55a(g)(4) is not considered adequate to detect cracking and prevent failure of the vessel head penetration nozzles for pressurized water reactors, and the licensee has not conducted additional inspections that would ameliorate this situation. This situation constitutes a special circumstance, the potential consequence of which is the loss of the reactor coolant pressure boundary, one of the "defense-in-depth" barriers, and the potential for the plant's core damage frequency to rise to a value approaching the conditional core damage probability of a loss-of-coolant accident, constituting an undue risk to public health and safety. Therefore, I do not have reasonable assurance that adequate protection will be maintained without performance of timely inspections that are sufficient to detect this type of degradation.

